

General Specification of Quality Assurance Inspection for

Domestic Gas Appliances



(Issue 2, August 2016)

Quality Assurance Inspection of
Domestic Gas Appliances

Contents

1.	Scope.....	2
2.	Definitions	2
3.	Basic Requirements	5
3.1	Connections.....	5
3.2	Gas Pressure Regulating Device	5
3.3	Ignition Devices	6
3.4	Flame Failure Devices.....	6
3.5	Overheat Protection Devices.....	6
3.6	Oxygen Deficiency Devices	6
3.7	Thermostats	6
3.8	Marking and Instructions.....	7
3.9	Electric Connection	8
4.	General Construction.....	9
4.1	Gas Components and Related Parts.....	9
4.2	Ease of Cleaning	9
4.3	Outlets for Combustion Products	9
4.4	Method of Adjusting Aeration.....	9
4.5	Design and Operation of Gas Taps	9
4.6	Glass-top Built-in Hotplate.....	10
4.7	Soundness of the Appliance	11
4.8	Flue Terminals	11
4.9	Portable hotplates fuelled by disposable LPG cylinders.....	11
5.	Requirements and Associated Test Methods	12
5.1	General	12
5.2	Gas Soundness Test.....	12
5.3	Water Soundness Test.....	13
5.4	Ignition	14
5.5	Flame Stability.....	15
5.6	Heat Input / Gas Consumption	16
5.7	Combustion Test.....	18
5.8	Flame Failure Devices.....	21
5.9	Electrical Insulation Resistance	22
5.10	Over-pressure Sensitive Safety Device	22
	Table 1 – Test Pressures	23
	Table 2 – Specifications of town gas and LPG	23
	Table 3 – Diameter of Pan / Mass of Water	24
	Table 4 – Dimensions of Pans.....	25
	Figure 1 – Bubble Leak Indicator	26
	Annex A - Precaution of Testings	27

FOREWORD

This specification applies to domestic gas appliances which are intended to burn either town gas or LPG normally distributed in Hong Kong. The specifications of the town gas and LPG are given in Table 2.

This specification covers Quality Assurance (QA) inspection listed in the Code of Practice GU05 by the Gas Authority.

Enquiry on this specification can be made to the following contact:

The Government of the Hong Kong Special Administrative Region
The Electrical and Mechanical Services Department
Gas Standards Office
3 Kai Shing Street,
Kowloon Bay,
Kowloon,
Hong Kong
Tel: 2808 3683
Fax: 2576 5945

1. Scope

This specification defines the scope and requirements of the Quality Assurance Inspection and associated testing methodology for domestic gas appliances. It applies both to appliances connected to a flue and to appliances not connected to a flue.

For an appliance to be subjected to Quality Assurance Inspection, Basic Safety Assessment tests (TA2) should have been completed and could be used as cross check reference.

For Basic Safety Assessment, reference can be made to the following specifications:

- General Specification of Basic Safety Assessment for Domestic Gas Appliances Not Connected to a Flue; and
- General Specification of Basic Safety Assessment for Domestic Gas Appliances Connected to a Flue.

2. Definitions

For the purposes of this standard, the following definitions apply.

Ambient temperature	Temperature of the Laboratory which is controlled at 20 °C ± 5°C.
Burner	A component which effects the gas/ air mixing and ensures the gas combustion.
Clothes dryer	An appliance in which textile material is dried.
Flame failure device	Means to incorporate an integral control device responsive to flame properties which by means of detecting the presence of a nominated flame will cause the gas supply to the appliance burner(s) to shut off safely in the event of ignition failure or inadvertent flame extinction.

Flame lift	A phenomenon characterized by the total or partial separation of the base of the flame from the burner port.
Flame stability	The state of the flames resting in a stable manner on the burner ports with no danger of flame lift or light-back.
Gas pressure regulating device	A device which automatically controls the pressure of gas in a gas pipe downstream of the device and/or maintains the downstream pressure between fixed limits independent of variations, within a given range, of the upstream pressure and the gas rate, such as external gas governor and integrated gas regulator.
Gas supply pressure	The relative static gauge pressure measured at the gas inlet connection of the appliance.
Grill	An appliance for dry cooking or grilling at a high temperature, either by radiation or direct contact.
Hotplate	Part or whole of a cooking appliance resting on raised support stand comprising one or more covered or uncovered burners and designed to support cooking vessels and, possibly, a grill and/or a rice cooker.
Light-back	The combustion of a flame in the body of a burner.
LPG	A liquefied petroleum gas consisting of butane (about 70%) and propane (about 30%). The specifications are given in Table 2.
Oven	A closed compartment for cooking roasts, pastries, etc.
Overheat protection device	Means a non-adjustable temperature actuated device designed to protect an appliance and its surroundings in the event of failure of the normal means of temperature control.

Pilot	A small burner which ignites a main burner by means of a flame.
Primary air	The volume of air entrained at the injector by unit volume of gas.
Primary air adjuster	A device allowing the aeration of a burner to be set at a predetermined value according to the supply conditions. The operation of changing the setting of this device is termed the 'adjustment of primary air'.
Rice cooker	Part or whole of a cooking appliance which is designed for cooking rice and once the rice is cooked the gas supply to the rice cooker is cut off automatically.
Tap	A device to isolate the gas supply to the various burners and to adjust their rate during use.
Thermostat	A device to maintain automatically a selected constant temperature. It includes a graduated scale for the selection of the temperature.
Town gas	A combustion gas supplied to the public by the Hong Kong and China Gas Company Limited. The specifications are given in Table 2.
Yellow tipping	A phenomenon characterized by the appearance of yellow coloration at the top of the blue cone of aerated flames.

3. Basic Requirements

3.1 Connections

3.1.1 Gas inlet connection should be suitable for direct connection to a thread to BS 21* (ISO 7-1) or an external thread of size G1/2 A or B to ISO 228-1# (formerly BS 2779) for mechanical assembly of a component part of a fitting.

3.1.2 For LPG appliances, the gas inlet can also be a nozzle suitable for connection to the 8.8 mm / 9.4 mm Ø rubber tubings defined in "GL-CG-4: Testing of Flexible Rubber Tubing and Tubing Assembly for use in LPG and Town Gas Low Pressure Installations" issued by the Government Laboratory, the Hong Kong Special Administrative Region.

3.1.3 Screwed water inlet and outlet connections should be suitable for connection to a thread to BS 21* (ISO 7-1).

3.1.4 Compression joints may also be used for connection to copper tubes conforming to EN 1057**

(*BS 21: Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads.)

(#ISO 228-1: Pipe threads where pressure-tight joints are not made on the threads-Part 1: Dimensions, tolerances and designation.)

(**EN 1057: Copper and copper alloys, Seamless, round copper tubes for water and gas in sanitary and heating applications.)

3.1.5 For gas connection of the portable hotplates fuelled by disposable LPG cylinders, an attachment device shall be incorporated inside the hotplate for the installation of the LPG cylinder specified by the manufacturer.

3.2 Gas Pressure Regulating Device

3.2.1 For built-in town gas appliances not connected to a flue, the appliance manufacturer shall explicitly state in the user

manual whether an external gas pressure governor is required or not under a nominal town gas supply pressure of 1.5 kPa in Hong Kong. If it is required, the brand name and model number of the gas governor shall be specified in the user manual by the manufacturer. If it is not required, the data plate/ label shall show the wording "External gas governor not required, 不需安裝外置氣體穩壓器", and a warning label shall be adhered near the gas inlet of the appliance.

3.2.2 For town gas appliances connected to a flue, gas pressure regulating devices shall be integrated with the appliances.

3.2.3 For portable hotplates fuelled by disposable LPG cylinders, the gas governor shall be incorporated in the hotplate.

3.3 Ignition Devices

Appliances shall incorporate with automatic ignition devices.

3.4 Flame Failure Devices

3.4.1 Appliances shall be provided with flame failure devices controlling the burner and the adjacent pilot, (if fitted).

3.4.2 The flame failure device shall be designed to fail safe. Failure of any components of the flame failure device indispensable to its performance shall cause the supply of gas to the burner and any pilot to be cut off automatically.

3.5 Overheat Protection Devices

Room-sealed heaters connected to a flue shall incorporate with overheat protection devices.

3.6 Oxygen Deficiency Devices

Flueless air heater for example clothes dryer not connected to a flue, and natural draught room heater, shall incorporate with oxygen deficiency devices (incomplete combustion preventive devices).

3.7 Thermostats

Ovens shall be provided with thermostats.

3.8 Marking and Instructions

3.8.1 Data Plate

An appliance should carry, in a position visible to the installer, a data plate in English and/or Traditional Chinese, giving at least the following:-

- a. Brand's name and/ or trade mark of the appliance;
- b. Model of the appliance;
- c. Type of flue (e.g. Back-flued; Top-flued) (only applicable for gas appliance connected to a flue)
- d. Type of gas to be used in Hong Kong (HK town gas or HK LPG); (This is not applicable for portable hotplate fuelled by disposable LPG cylinder.)
- e. Operating gas pressure of appliance (in kPa or mbar); (This is not applicable for portable hotplate fuelled by disposable LPG cylinder.)
- f. Individual rated heat input of the burners / Rated heat input (either in kW or in g/h for portable hotplate fuelled by disposable LPG cylinder);
- g. Name of Recognized Certification Authority (RCA) of TA1 approval;
- h. TA1 approval certificate no.;
- i. Appliance serial number; and
- j. Warning notice "External gas governor not required, 不需安裝外置氣體穩壓器" if applicable for built-in town gas appliance not connected to a flue.

Warning Labels having regard to user safety shall be durable, legible and clearly printed in English and Traditional Chinese.

The characters in the data plate should be indelible to common solvents such as water and kerosene. It shall be checked by rubbing with cotton cloth soaked separately with water and petroleum spirit and each for 15 seconds. Afterwards, the marking shall still be legible, and the plate shall show no curling and shall not be easily removed.

3.8.2 Operating Instructions

- a. These instructions, printed in both Traditional Chinese and English, should be supplied with every appliance, advising the user on how to operate and maintain it.

3.8.3 Installation and Servicing Instructions

- a. These instructions shall be printed in Traditional Chinese Language. Other language versions may also be supplied with the appliance.
- b. When applicable, installation instructions should comply with the Gas Safety (Installation and Use) Regulations.
- c. For built-in town gas appliance not connected to a flue, if external gas governor is required, the brand name, model number and pressure setting of the gas governor shall be specified in the installation and servicing instructions by the manufacturer. If it is not required, a warning label shall be adhered near the gas inlet of appliance.
- d. The installation instructions should not contain any information that is irrelevant to use of such gas appliance in Hong Kong.

3.9 Electric Connection

An appliance designed for use with power supply shall be suitable for 220 V single phase, 50 Hz a.c.

4. General Construction

4.1 Gas Components and Related Parts

4.1.1 Gas components and related parts should be connected securely by mechanical joints such as welding, screw threads by bolt and nut, etc.

4.1.2 Burners, pilots, igniters and their mountings shall be so designed that they can only be located correctly in relation to every component with which they are designed to operate.

4.2 Ease of Cleaning

Any part of the appliance requiring cleaning by the user shall be easily accessible without having to move the appliance or use a tool for dismantling. It shall be possible to replace such parts correctly and without difficulty, and difficult to reassemble incorrectly.

4.3 Outlets for Combustion Products

4.3.1 Combustion products outlets shall be so designed that they cannot be obstructed by:

- a. utensils used with the appliance e.g. pans, griddle plates, etc.;
- b. food spillage; and
- c. positioning of the appliance too close to a wall.

4.4 Method of Adjusting Aeration

Primary air adjusters shall not be capable of closing the air inlet completely or be capable of being set in such a manner as to cause gas to spill from the burner venturi throat. Adjusters shall not be liable to inadvertent movement.

4.5 Design and Operation of Gas Taps

4.5.1 General

Each burner shall be controlled by a tap or a device assuring the opening and closing of its supply.

4.5.2 Plug Type Taps

- a. A plug type tap shall have two stops, one in the 'off ' position, one at the end of the tap travel.

- b. The reduced rate may be obtained either at the end of the tap travel or in an intermediate position between the closed and fully opened positions.

4.5.3 Combined Control Taps

If oven and grill burners are situated in the same compartment, one combined control tap to control the oven and grill burners can be used. But such combined control tap shall have a device to retain it against accidental movement from the 'off ' position.

4.5.4 Control Handles

- a. The purpose of handles shall be clearly identifiable with respect to the burners they control.
- b. The closed, open and reduced rate positions shall be marked in a visible and durable fashion.
- c. If control handles operate by turning, the closing direction shall be clockwise. This does not apply to combined taps.
- d. Control handles shall be so designed that they can neither be fitted in the wrong position nor be moved by themselves.
- e. If the control handles operate by turning, and their axis are in a horizontal plane, the closure mark placed in a vertical plane shall be situated above the turning axis of the handle in its closed position. The closed position of the tap shall not give rise to any possibility of confusion with an open position.
- f. For an appliance with an oven and grill burner and they are situated in the same compartment and these burners are controlled by different handles, the handles shall be interlocked so that gas can issue from only one of the two burners at any one time.

4.6 Glass-top Built-in Hotplate

For a glass-top built-in hotplate, the weight of cooking utensils shall not be supported by the glass.

4.7 Soundness of the Appliance

4.7.1 For room-sealed appliances, the soundness of the heating body and of the connection of an appliance to the combustion air inlet and products outlet ducts shall be effected by mechanical means only. However, those parts of the assemblies which do not require to be dismantled for routine maintenance may be jointed using mastics or pastes in such a way that soundness is assured in continuous service under normal conditions of use.

4.7.2 For room-sealed appliances, the construction of the whole assembly shall guarantee soundness in relation to the room in which an appliance is installed.

4.8 Flue Terminals

The terminal should, in general, have the following characteristics:-

4.8.1 Effective protection against the entry of birds, leaves, rain, etc. The external surfaces of the terminal shall have no opening which could permit the introduction of a 16 mm (5/8 in) diameter ball into the ducts; and

4.8.2 The flame cannot be seen from the outlet openings of the terminal.

4.9 Portable hotplates fuelled by disposable LPG cylinders

Installation of cylinder:-

4.9.1 Attaching and detaching of a cylinder to and from the hotplate shall be smooth, secure and without the use of a tool.

4.9.2 The attachment device shall be such that the cylinder cannot be fitted when the gas tap is in the "ON" position.

5. Requirements and Associated Test Methods

5.1 General

- 5.1.1 Tests are to be carried out with town gas or with LPG at nominal pressure given in Table 1 unless otherwise specified.
- 5.1.2 For portable hotplates fuelled by disposable LPG cylinders, tests are to be carried out with LPG cylinders specified by the manufacturer, and with the regulator preset by the manufacturer. The mass of gas in the cylinders should not be less than 90% of the rated filling capacity.
- 5.1.3 Tests shall be conducted in draught-free area.

5.2 Gas Soundness Test

5.2.1 Requirements

The test consists of three parts:

- a. Soundness of gas circuit upstream of the gas tap of the appliance.
- b. Soundness downstream of the gas tap and of valves other than the tap; and
- c. Leakage external to gas circuit.

Soundness test is deemed to be satisfactory if, the leakage in (a) is less than 0.07 l/h, in (b) does not exceed that observed in (a) by more than 0.07 l/h and in (c) no leakage is detected.

For portable hotplates fuelled by disposable LPG cylinders, there shall be no leakage external to gas circuit.

5.2.2 Test Method

- a. General (not applicable for portable hotplates fuelled by disposable LPG cylinders)
 - i. In test (5.2.1.a), the gas tap and other gas valves, e.g. flame failure valve are closed. In test (5.2.1.b), the gas tap is opened and other gas valves are in closed position.
 - ii. To determine the soundness in (5.2.1.a) and

(5.2.1.b), a bubble leak indicator as shown in Figure 1 may be used. The leakage rate is measured in terms of the number of bubbles produced over, say, one minute in the indicator. Calibration shall be done on the indicator before use to determine the equivalent leakage rate.

- iii. For tests (5.2.1.a) & (5.2.1.b), the tests are carried out with gas at a pressure of 3 kPa (12" W.G.) for town gas and 4.5 kPa (18" W.G.) for LPG upstream of the appliance.
 - iv. Before each reading, at least 5 minutes is allowed for thermal equilibrium to be reached.
 - v. In test (5.2.1.c), the appliance is put into operation, a combustible gas detector or leak detection fluid can be used to detect any leakage from the gas circuit, especially the gas carrying parts downstream of gas valves. Test for spillage from venturi throat of atmospheric aerated burners by the gas detector.
- b. For portable hotplates fuelled by disposable LPG cylinders:-
- i. The gas tap is opened and the flame failure valve in closed position. A combustible gas detector or leak detection fluid can be used to detect any leakage from the gas circuit.
 - ii. The hotplate is put into operation and a combustible gas detector is used to detect any leakage especially the parts not yet tested in (i).

5.3 Water Soundness Test

5.3.1 Requirements

There shall be no permanent distortion or water leakage when subject to water pressure ~~440~~ 400 kPa (~~50~~ psi).

5.3.2 Test Method

Connect the appliance to water supply at a pressure of 400 kPa. Fill the appliance with water, close the outlet valves. Maintain the pressure for 1 minute.

5.4 Ignition

5.4.1 Requirements

- a. Ignition shall be assured at all operational rates. It shall be smooth with no light-back and prolonged flame lift.
- b. For electric ignition, out of 10 ignition trials, there should be 8 or more successful ignitions and with no successive ignition failures.
- c. Successful ignitions shall be smooth with no light-back and the flame shall carry over to all ports within 5 seconds.

5.4.2 Test Method

- a. Ignition by permanent pilots
 - i. Ignite the pilot, if the pilot rate is adjustable, reduce it to the minimum required to keep the supply to the burner open.
 - ii. Operate the appliance, check ignition of the main burner and the pilot. Turn the main burner, quickly from ON to OFF three times. The appliance shall continue to operate satisfactorily.
- b. Electric ignition
 - i. Operate the appliance by fitting dry cell(s) in position, or connect the appliance to mains voltage, whichever is applicable.
 - ii. Ignition is carried out in accordance with manufacturer's instructions. The ignition tests shall be carried out with both individual burners and any possible combination of burners.
 - iii. For continuous spark ignition, the duration of each ignition trial should be less than 2 seconds.

5.5 Flame Stability

5.5.1 Requirements

The flame shall be stable, free from light-back, flame lift and yellow tipping for the whole operating range from full rate to reduced rate.

5.5.2 Test Method

a. General

- i. Ignite the burner. Check the flame stability of the burner after ignition and ensure that the flame remains stable throughout the cycle of the operation.

b. Hotplate Burners

- i. The tests are carried out successively with and without test pans placed on the pan supports of the burners. The test pan used should be that in accordance with Table 3 and Table 4 or of size 320 mm, whichever is smaller.
- ii. When the burner is adjusted from full to reduced rate at both the maximum and minimum supply pressures, cross-lighting of the various parts of the burners and flame stability shall be assured.

c. Burner with Thermostat

Set the thermostat to highest setting. Allow the appliance to heat up until the thermostat cuts down the gas rate. Then set the thermostat to lowest setting. Allow a further 20 minutes and set the thermostat back to the highest setting. Check that the flame remains stable throughout the test.

d. Burner in Compartment with Door

With the door closed, and thermostat if any, at the highest setting, allow the appliance to heat up for 10 minutes. Check that the actions of opening and closing the door do not adversely affect the flame stability. Allow the appliance to heat up for a further 20 minutes

then turn down to the minimum operational rate. Again check that the actions of opening and closing the door do not adversely affect the flame stability.

(Note 1: For burners with modulating thermostats the minimum operational rate is the bypass rate. If no thermostat is fitted the minimum operation rate is 15% of the full-on rate or the lowest of any fixed settings which may be provided. In the case of on-off type thermostats with no by-pass, the flame stability requirements at reduced input rates are not applicable.)

(Note 2: The door should be opened and closed without undue force and an interval of 15 seconds should be left between successive opening and closing action.)

(Note 3: For appliances with door switches which cut off the burner when the doors open, the test is not applicable.)

5.6 Heat Input / Gas Consumption

For portable hotplates fuelled by disposable LPG cylinders, gas consumption test (Clause 5.6.3) shall be applicable, but neither Individual Heat Input test nor Total Heat Input test.

5.6.1 Individual Heat Input

a. Requirements

The heat input shall be within ± 10 % tolerance of the nominal heat input declared by the manufacturer.

b. Test Method

Measurements are taken when the burner is set at the full rate and heated to thermal equilibrium*, except for burner provided with a thermostat.

(* Volume rates at thermal equilibrium will be regarded as steady if they do not vary by more than 1 % over a period of 5 min.)

(Note: The heat input test of gas appliance not connected to a flue

shall be undergone without any aluminum pans.)

For burner provided with thermostat, measure the gas consumption during the first 5 minutes of operation with the appliance initially at ambient temperature, the thermostat at highest setting, and door, if any, opened.

The volume flow rates V shall be measured with gas supply pressure at nominal pressure (see Table 1), except for town gas appliances that do not incorporate a regulator, the volume rates shall be measured at a test pressure specified by the manufacturer and the specified pressure shall be within 1.0 kPa to 1.5 kPa.

The heat input D_N is calculated as follows:

$$D_N = VP_P F$$

where:

D_N : Heat input in MJ/h

V : Volume flow rate m³/h

P_P : Gross C.V. in MJ/m³ (dry gas, 15 °C, 101.3kPa)

F : Correction Factor, which is calculated as follow:

$$F = \sqrt{\frac{(P_a + P_m - W)d + 0.622W}{(P_a + P_m)d}} \sqrt{\left(\frac{P_a + P_m}{101.3}\right) \left(\frac{288}{(273 + T)}\right)} \sqrt{\frac{101.3 + P_m}{101.3}}$$

where:

d : Relative density of dry gas

W : Saturation vapour pressure of water at the dew point of the gas in kPa

P_m : Gas pressure at the meter in kPa

P_a : Atmospheric pressure in kPa

T : Gas temperature in °C

5.6.2 Total Heat Input

a. Requirements

The heat input shall be within ± 10 % tolerance of the nominal heat input declared by the manufacturer.

(**Note:** If combined control tap is used for one burner, the

maximum heat input mode shall be used in that particular burner.)

b. Test Method

Ignite all the burners and measure the total volume flow rate. The total heat input is calculated as given in 5.6.1.b. The conditions of measurement for the individual burners as specified in 5.6.1.b are applicable here.

5.6.3 Gas consumption (only for portable hotplates fuelled by disposable LPG cylinders)

a. Requirements

The gas consumption shall be within $\pm 10\%$ tolerance of the nominal input declared by the manufacturer.

b. Test Method

The mass of an LPG cylinder is measured before and after the test. In the test, the hotplate is ignited at the full rate for 30 minutes. Three tests are to be carried out with 3 different cylinders. The gas consumption is calculated as follows:

$$W = \frac{2}{3} \sum_{n=1}^3 (W_{oi} - W_i)$$

where:

W : gas consumption (g/h)

W_{oi} : mass of cylinder before test (g)

W_i : mass of cylinder after test (g)

5.7 Combustion Test

5.7.1 Requirements

The CO content in the dry, air-free products of combustion shall not exceed 0.2 % and 0.14 % respectively for appliances connected to a flue and appliance not connected to a flue.

The CO content relative to the dry, air-free products of combustion can be calculated by the formulae below:

$$\%CO = \%CO_2 (\text{Neutral Combustion}) \times \frac{CO}{CO_2} (\text{in samples})$$

where:

%CO₂ (Neutral Combustion) is the calculated carbon dioxide content in dry, air free products of combustion, (for both town gas and LPG, the value is 14.0 %).

5.7.2 Test Method

a. General

- i. Tests are carried out in still air condition.
- ii. Thermostat, if any, is set at maximum value.
- iii. Gas rate is set to full rate.
- iv. Gas supply pressure is adjusted to maximum value or to nominal value (see Table 1) whichever gives the higher heat input. For an underfired or pre-mixed burner, the test is to be repeated at the gas supply pressure of 0.75 kPa (3" W.G.) for town gas and 2 kPa (8" W.G.) for LPG and where applicable at its turn-down settings.
- v. Sampling of flue gases is done when the appliance is at thermal equilibrium. For burner provided with thermostat, the measurements are taken during the first 5 minutes of operation with the appliance initially at ambient temperature. Sampling is collected where the composition of the sample is as near as possible, to the average composition of all the products of combustion.
- vi. The measurement position should be selected such that the measured CO₂ concentration is at least 1 %.

b. Hotplate burners

- i. An aluminum pan is placed concentrically on each of the burners. The size of pan used and mass of water placed in the pan shall be in accordance

with Table 3 and Table 4.

- ii. When the volumetric rate is at thermal equilibrium, the products of combustion shall be sampled evenly along the whole circumference of the pan at about 1/2 pan height below the pan edge and about 3 mm away from the pan side.
- c. Burners with outlets for discharge of products of combustion
 - i. Where applicable the compartment door is shut and the compartment is empty, except that vessel/container/pan provided is placed in position.
 - d. Gas Appliance Connected to a Flue
 - i. Natural Draught Appliances
 - The appliance is installed together with the terminal supplied by the manufacturer according to the manufacturer's instructions.
 - The connecting ducts are adjusted, if applicable such that their lengths correspond to the maximum wall thickness for which the ducts are designed.
 - Sampling will be at the outlet of the flue terminal.
 - ii. Fanned Draught Appliances
 - The length of flue pipe shall be the maximum extension in accordance with the manufacturer's instructions, and the terminal supplied fitted at the end of the flue pipe.
 - Sampling will be at the outlet of flue terminal.
 - For open flue fanned draught appliance with draught diverter, the existence of spillage, i.e. flow-out of flue gas from the draught diverter, shall be examined by means of visual aids at not less than 15 minutes after igniting the burner. There shall be no

spillage at the draught diverter.

5.8 Flame Failure Devices

5.8.1 Requirements

The delay time shall be as follows:

- a. Gas appliance not connected to a flue
 - i. Ignition Delay Time (opening time) shall not exceed 10 s if there is continuous manual intervention
 - ii. Ignition Delay Time (opening time) shall not exceed 60 s if there is no continuous manual intervention
 - iii. Extinction Delay Time (closing time) shall not exceed 60 s where the burner is situated inside a compartment
 - iv. Extinction Delay Time (closing time) shall not exceed 90 s if the burner is not enclosed
- b. Gas appliance connected to a flue
 - i. Ignition delay time (opening time) shall not exceed 20 s for continuous manual intervention; otherwise, time limit shall not exceed 60 s.
 - ii. Extinction delay time (closing time) shall not exceed 60 s.

5.8.2 Test Method

- a. The ignition delay time (opening time) is that between the moment when the gas is lit at the pilot (or main burner, if there is no pilot) and that when the flame failure device acts.
- b. Measure the extinction delay time (closing time) at the end of combustion tests.
- c. The extinction delay time is measured between the moment when the pilot and burner are extinguished by shutting off the gas supply and the moment when, after turning on again, the gas supply is stopped through the action of the flame failure device.

5.9 Electrical Insulation Resistance

5.9.1 Requirements

The electrical insulation resistance of the appliance shall not be less than 1 MΩ.

5.9.2 Test Method

The insulation resistance between the live part and non-live metal part or the part connected to earthing is measured by the 500V insulation-resistance tester.

5.10 Over-pressure Sensitive Safety Device (Only for portable hotplates fuelled by disposable LPG cylinders)

5.10.1 Requirements

Appliances shall be provided with over-pressure sensitive safety device. The over-pressure sensitive safety device shall be constructed so that the gas supply is stopped, by closing the gas-passage or removal of the built-in cylinder from the appliance, at a pressure of the part from the junction of the cylinder and appliance to the high pressure part of the appliance regulator in a range of ≥ 0.4 MPa but ≤ 0.6 MPa.

5.10.2 Test Method

The gas-passage closed at a pressure of the high pressure part in a range of ≥ 0.4 MPa but ≤ 0.6 MPa shall be constructed so that the gas-passage never opens automatically after the gas-passage is closed at a pressure change in the high pressure part.

Table 1 – Test Pressures

Type of Gas	Test Pressure		
	Minimum Pressure	Nominal Pressure	Maximum Pressure
Town gas	0.75 kPa (3.0 in W.G.)	1.5 kPa (6.0 in W.G.)	2.00 kPa (8.0 in W.G.)
LPG	2.00 kPa (8.0 in W.G.)	2.90 kPa (11.5 in W.G.)	3.50 kPa (14.0 in W.G.)

Table 2 – Specifications of town gas and LPG

Properties		Town gas	LPG
1. Gross C.V.	Btu/ft ³ at 15.56°C, 101.37 kPa, wet	455±1%	---
	MJ/m ³ at 15.00°C, 101.32 kPa, dry	17.27±1%	116.76±1%
2. Specific Gravity (Air = 1)		0.480 - 0.537	1.893 - 1.935
3. Wobbe Index, MJ/m ³		23.2 - 24.8	83.8 - 84.6
4. Weaver Flame Speed Factor (H ₂ = 100)		34.0 - 37.0	16.01
5. Composition, % by Volume		Hydrogen : 46.3 - 51.8 Methane : 28.2 - 30.7 Carbon Dioxide : 16.3 - 19.9 Carbon Monoxide : 1.0 - 3.1 Air : 0 - 3.3	Butane : 66 - 74 Propane : 26 - 34

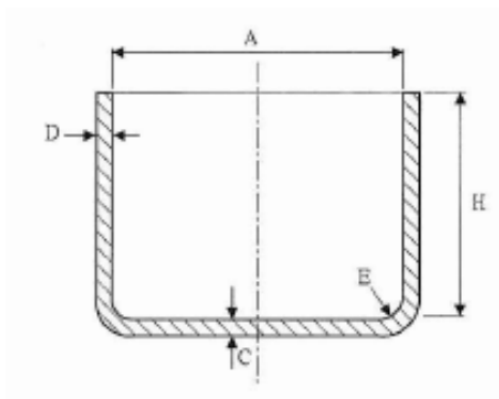
Table 3 – Diameter of Pan / Mass of Water

Nominal Heat Input (kW)	Gas Consumption for LPG (g/h)	Internal Diameter (mm)	Mass of Water in Pan (kg)
$H \leq 1.33$	$G \leq 97$	180	2.0
$1.33 < H \leq 1.65$	$97 < G \leq 120$	200	2.8
$1.65 < H \leq 1.99$	$120 < G \leq 145$	220	3.7
$1.99 < H \leq 2.37$	$145 < G \leq 172$	240	4.8
$2.37 < H \leq 2.78$	$172 < G \leq 202$	260	6.1
$2.78 < H \leq 3.22$	$202 < G \leq 234$	280	7.7
$3.22 < H \leq 3.7$	$G > 234$	300	9.4
$H > 3.7$	NA	320	11.4

Table 4 – Dimensions of Pans

Dimension	Unit	Pan Designation											Tolerance
		12	14	16	18	20	22	24	26	28	30	32	
A	mm	120	140	160	180	200	220	240	260	280	300	320	±1%
H	mm	90	100	110	120	130	140	150	160	170	180	190	±1%
C min.	mm	1.6	1.6	1.8	2	2	2	2	2.5	2.5	2.5	2.5	---
D min.	mm	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.8	1.8	1.8	1.8	---
E	mm	2	2	2.5	2.5	2.5	3	3.5	3.5	3.5	3.5	3.5	0, +0.5
Area of Base	cm ²	113	154	201	254	314	380	452	531	615	707	804	---
Mass	g	220	270	340	440	540	680	800	965	1130	1350	1520	±5%
Mass of Lid*	g	58	70	86	105	125	149	177	208	290	323	360	---

*Mass without handles calculated for lids in aluminium (density 2,700 kg/m³) and given for guidance.



A : Internal diameter measured at the top

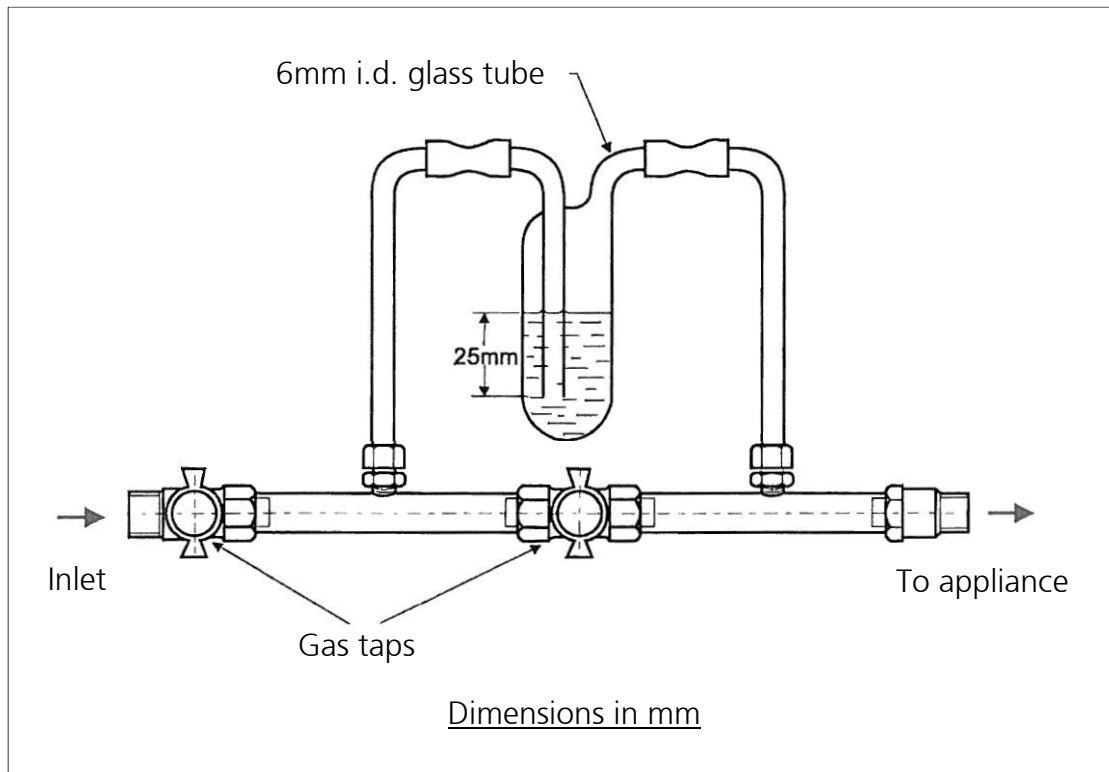
H : Internal height

C : Thickness of the base

D : Thickness of the side

E : Internal radius

Figure 1 – Bubble Leak Indicator



Annex A - Precaution of Testings

All testing specification and procedures described in this method shall be carried out by competent laboratory workers. The safety precaution given does not purport to address all of the safety concerns associated with the method's use. It is the responsibility of the user of this method to follow appropriate safety and health measures applicable to chemical, physical and mechanical testing laboratories.

- I. To avoid draughts which may affect the performance of the appliances which is not connect to a flue, the tests are to be conducted with the appliance placed within two L-shape wooden panels.
- II. Before using a gas pressure gauge (U-gauge), check its soundness.
- III. Before using a bubble leak indicator, check the water level in the glass bottle (see Figure 1).
- IV. In carrying out the gas soundness test, check the soundness of connecting points between the bubble leak indicator and the gas appliance with gas detector or leakage detection fluid.
- V. Before using a wet gas meter, check the water level and the meter levelling.
- VI. In using the 500 V insulation resistance tester, avoid touching the connecting junctions of tester.
- VII. After connection/ reconnection of a gas supply, check soundness of gas connections by a gas pressure gauge and ensure that the static pressure is maintained.